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Set Name	Query	Hit Count	Set Name result set
DB=PGPB,USPT; PLUR=YES; OP=ADJ			
<u>L47</u>	L45 and new	1	<u>L47</u>
<u>L46</u>	L45 and inventory	1	<u>L46</u>
<u>L45</u>	6282517.pn.	1	<u>L45</u>
<u>L44</u>	L42 not l43	8	<u>L44</u>
<u>L43</u>	L42 and deliver	7	<u>L43</u>
<u>L42</u>	wolfe.in. and 705/\$.ccls.	15	<u>L42</u>
<u>L41</u>	6728685.pn. and cac	1	<u>L41</u>
<u>L40</u>	6728685.pn. and payment	1	<u>L40</u>
<u>L39</u>	6728685.pn. and title	0	<u>L39</u>
<u>L38</u>	6728685.pn. and deliver	1	<u>L38</u>
<u>L37</u>	6728685.pn. and order same customer	1	<u>L37</u>
<u>L36</u>	L34 and (customer service) and order	126	<u>L36</u>
<u>L35</u>	L34 and (customer service)	129	<u>L35</u>

<u>L34</u>	L33 and inventory	632	<u>L34</u>
<u>L33</u>	(automobile or vehicle) and @ad<20010307 and 705/\$.ccls.	2059	<u>L33</u>
<u>L32</u>	(automobile or vehicle) and (back order) and @ad<20010307 and 705/\$.ccls.	<i>✓</i> 14	<u>L32</u>
<u>L31</u>	L30 and (notify same customer same availability)	0	<u>L31</u>
<u>L30</u>	(automobile or vehicle) and (back order) and @ad<20010307	208	<u>L30</u>
<u>L29</u>	L28 and @ad<20010307	<i>✓</i> 78	<u>L29</u>
<u>L28</u>	available same (back order)	121	<u>L28</u>
<u>L27</u>	satisfied same (back order)	<i>✓</i> 7	<u>L27</u>
<u>L26</u>	confirm same (back order)	<i>✓</i> 19	<u>L26</u>
<u>L25</u>	L24 and (customer or purchaser or user)	<i>✓</i> 69	<u>L25</u>
<u>L24</u>	L22 and (inventory and (ship or deliver or delivery or ship\$))	<i>✓</i> 71	<u>L24</u>
<u>L23</u>	L22 and inventory	<i>✓</i> 90	<u>L23</u>
<u>L22</u>	L21 and @ad<20010307	1750	<u>L22</u>
<u>L21</u>	(back order)	2752	<u>L21</u>
<u>L20</u>	L16 not l15 and (availability same (update or notify or customer))	<i>✓</i> 3	<u>L20</u>
<u>L19</u>	L16 not l15 and (inventory same (update or notify or customer))	<i>✓</i> 4	<u>L19</u>
<u>L18</u>	L16 not l15 and inventory	<i>✓</i> 5	<u>L18</u>
<u>L17</u>	L16 not l15	<i>✓</i> 6	<u>L17</u>
<u>L16</u>	(back order) same invoice same customer	<i>✓</i> 6	<u>L16</u>
<u>L15</u>	(back order) same notify same customer	<i>✓</i> 7	<u>L15</u>
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<u>L12</u>	L11 and inventory	<i>✓</i> 23	<u>L12</u>
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<u>L10</u>	L4 and (back order) and notify	0	<u>L10</u>
<u>L9</u>	L4 and (back order)	<i>✓</i> 1	<u>L9</u>
<u>L8</u>	L4 and (line items) and stock	0	<u>L8</u>
<u>L7</u>	L4 and (line items) and inventory	0	<u>L7</u>
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<u>L3</u>	L2 and (customer same (back order))	<i>✓</i> 57	<u>L3</u>
<u>L2</u>	L1 and @ad<20010307	1750	<u>L2</u>
<u>L1</u>	back order	2752	<u>L1</u>



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result set

<u>L12</u> L11 and inventory	23	<u>L12</u>
<u>L11</u> l3 and notify	28	<u>L11</u>
<u>L10</u> L4 and (back order) and notify	0	<u>L10</u>
<u>L9</u> L4 and (back order)	1	<u>L9</u>
<u>L8</u> L4 and (line items) and stock	0	<u>L8</u>
<u>L7</u> L4 and (line items) and inventory	0	<u>L7</u>
<u>L6</u> L4 and (line items)	1	<u>L6</u>
<u>L5</u> L4 and (update inventory)	0	<u>L5</u>
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<u>L3</u> L2 and (customer same (back order))	57	<u>L3</u>
<u>L2</u> L1 and @ad<20010307	1750	<u>L2</u>
<u>L1</u> back order	2752	<u>L1</u>

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Subjects: [Warehousing](#), [Suppliers](#), [Studies](#), [Strategic planning](#), [Logistics](#), [Electronic data interchange](#), [Adv](#)

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Locations: [North America](#)

Author(s): [Raney, Mark A](#), [Walter, Clyde Kenneth](#)

Publication title: [International Journal of Physical Distribution & Logistics Management](#). Bradford: 1992. Vol. 22, Iss. 8

Source Type: Periodical

ISSN/ISBN: 09600035

ProQuest document ID: 1136132

Text Word Count: 3750

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More Like This [» Show Options for finding similar articles](#)**Abstract** (Article Summary)

The extent to which electronic data interchange (EDI) is used in warehouses to communicate with suppliers (as opposed to customers) is investigated through a questionnaire distributed to 200 warehouse managers. EDI is generally defined as computer-to-computer interchange of business documents within an organization. Results indicate that EDI is used to a large extent in the warehousing function; in fact warehousing personnel, working with customers, contributed to the development of their firms' EDI systems. While EDI use was strong on the outbound side, its use at the warehouse-supplier interface was relatively non-existent. The idea to adopt an EDI system had originated most frequently from the firms' customers. Four out of 5 warehouse EDI users identified time savings, customer relations, reduced paperwork, and accuracy of information as benefits. Warehouse managers will need to demonstrate to their suppliers the mutual benefits which both sides of this interface will receive through the more timely and accurate information exchanges provided by EDI.

Full Text (3750 words)

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INTRODUCTION

The purpose of this article is to investigate the extent to which EDI has been used by warehouses in communicating with their suppliers and to offer suggestions for future EDI implementation in the warehouse industry. The results of this study draw attention to an area of EDI implementation which has the potential to increase the overall efficiency of the firm.

BACKGROUND

WAREHOUSING AS AN INFORMATION LINK

Warehousing fills several roles and interrelationships, each requiring adequate information flow between the warehouse and its customers and its suppliers. Described as "a sophisticated link in an extremely fragile chain of events" 1!, warehousing has been credited with playing a vital role in providing a desired level of customer service at the lowest possible total cost 2!. Warehouses create time utility for the goods which are stored, and are important as companies use customer service as a dynamic competitive tool. The roles of warehouses have been identified as transport consolidation, product mixing, service, contingency protection, and smoothing (or decoupling successive stages in a process) 3!. Warehouse information necessary for performing these multiple roles is valuable only to the extent that it is accurate as well as timely.

EDI EXPLAINED

Electronic data interchange (EDI) is generally defined as "the intercompany computer-to-computer interchange of business documents in standard formats" 4!. Expansions of this definition include paperless or electronic trading 5!. This exchange of standardized business data, from one computer memory device to another, streamlines the interactions which organizations may have with customers, distributors, suppliers, carriers and service providers 6!. EDI increases efficiency through its ability to operate more accurately and with more speed. The electronic transfer of business documents, such as purchase orders, requests for quotes, invoices and remittance information, replaces verbal and written communications.

Following its origins in the Transportation Data Co-ordinating Committee's 1975 standards 7!, EDI has become one of the strategies affecting relationships between shippers and carriers 8!. The speed and accuracy of EDI are especially beneficial in international trade, with its additional documentation requirements and greater physical separations 9,10,11!, EDI users have been reported in the transport, grocery, automotive, electronics, chemical, retailing, health care and warehousing industries 12!.

Firms with a large volume of repetitive, standard transactions may benefit most from EDI, in terms of accuracy, personnel cost savings, time value, paper and space savings, the development of close relationships with suppliers, information cost savings and inventory savings 3!. Customer service is improved through timely communications of inventory availability, delivery dates, order status, order tracing, and **back-order** status. **Customers** with EDI access may treat the warehouse computer and **inventories** as their own 14!; this practice has been referred to as improved visibility of inventories 15!. Potential weaknesses are incompatible technologies or reluctant implementation 16,17!, system malfunctions 18! and "viruses" introduced by outsiders with access to the user's computer files 19!. The long-term strategic benefits--creating a competitive advantage for firms--have been described as the most significant, albeit the most difficult, to measure 20,21!.

Research studies of EDI use have covered general industrial groupings 22! or the functional area of purchasing 23,24!. While most of these studies did not focus on warehousing, a 1986 survey of 32 warehouse professionals found agreement that EDI would increase in private warehousing and between Manufacturers and public warehouses 25!. Anecdotal evidence that EDI is being used in the warehouse industry has been supplied by the trade press 13;26-29!. Interest has been generated for the warehouse information network standards (WINS) document in the grocery industry 5, pp. 193-4;30,31!, quick response in retailing 32,33! and automatic data collection 34,35!.

The purpose of this study was to answer the following questions:

- * To what extent is EDI being used in the warehouse industry?
- * What are the implications of EDI use for warehouse and logistics managers?

DATA COLLECTION AND RESPONSE

METHODOLOGY

The membership list of the Warehouse Education and Research Council (WERC) was chosen as the sample frame. The WERC includes individuals who have indicated professional involvement with warehouse functions. Their firms include both private and public warehouses. Nearly all the addresses on the membership list were in the

USA and Canada, thus defining a North American boundary for the sample.

The dispersed nature of the sample dictated a mail questionnaire 36!. The sample of 200 was picked from the membership directory using every P/Nth name (where P is the list size of 2,060 and N is the sample size), after a starting-point was picked from a table of random digits 37!.

A personalized covering letter explained the purpose of the study as well as the university affiliation of the researchers and requested that the questionnaire be completed by the individual responsible for warehousing activities. Following Swain's suggestions for reducing non-response, the confidentiality of individual information was assured, and a copy of the aggregate results was offered 36, pp. 38-9!.

The questionnaire included a combination of open-ended, multichotomous, dichotomous and scaling formats. Respondents were first asked about the general means of information exchange for their warehouse operations and who developed the system. Then specific questions about their use of EDI were asked. If they used EDI, they indicated the types of communications (e.g. order processing, bill paying) between production, warehousing, customers, suppliers and carriers. Non-users were asked why EDI was not being used. Users were next asked where the idea for implementing EDI originated. Respondents were also asked about the types of information exchanged, the frequency of this exchange, and the benefits and disadvantages of EDI. The survey instrument concluded with questions about the size of the firm (in terms of number of employees and estimated annual sales), the type of activity, and the products handled at the particular facility.

RESPONSES

Fifty-five individuals replied to the survey, a 27.5 per cent response rate. As Parasuraman noted, a larger sample size would not by itself reduce non-sampling errors (sampling frame error, non-response error, and data error) 38!. Sampling frame error was considered minimal because most of the members of the WERC were warehousing professionals. Data error problems were assumed to be controlled by a survey instrument worded clearly to facilitate answering. As Parasuraman explains, non-response error is "a bias that occurs when the final sample differs in a systematic way from the planned sample" 38, p. 524! and is more dependent on the nature of the discrepancy (between the intended sample and final sample) than on the response rate. Among other reasons for non-response were non-receipt (minimal in this case since only two were returned undeliverable) and recipients unable to answer because they lacked the information requested or the time and resources perceived necessary to furnish the information 38, pp. 524-5!. Non-response to a postal questionnaire is a concern, however, because the reason for non-response is not known. Swain felt that the most important reason for non-response is lack of identification with the purpose of the questionnaire 36, pp. 37-8!. In the current study, the professional orientation of the sample members would nearly assure an understanding and interest in the general topic. It was not felt that the responses of those taking the time to fill out a survey form would vary systematically from those who did not.

One means for judging non-response bias is to compare the attributes of the respondents with the known attributes of the sample frame 39!. While such background information about the WERC membership was limited 40!, there was no indication that the final sample differed appreciably from the overall membership in terms of geographic dispersion or type of activity.

RESULTS AND DISCUSSION

EXTENT OF USE

Firms were asked what means of communication they used for their warehousing activities. With multiple responses possible, telephone equipment (including facsimile devices) and the US Postal Service ranked first and second, with EDI a strong third. With a 73 per cent usage, EDI is recognized as a method of exchanging information with at least some of the parties involved in warehouse operations. A companion question asked if the respondent's facility (which may include more than just warehousing) currently used EDI. A slightly larger group, 76 per cent, indicated yes. While the percentage reporting EDI usage is high, the actual level of EDI activity, expressed as a percentage of transactions, is not known.

Eighteen per cent of the users had introduced EDI at their facility between 1980 and 1985. Another 62 per cent added EDI in the next four years, and the remaining 20 per cent of the users began in 1990 or later. As a relatively new concept, EDI had been adopted, to some extent, fairly quickly among these users.

Figure 1, compiled from responses to a series of itemized rating scales 41!, indicates various warehouse EDI uses and contacts. (Figure 1 omitted) Some of the uses and contacts are routine activities (order processing, bill paying) and others refer to parties (warehousing, production, customers, suppliers, carriers) internal and external to the firm. As might be expected, the sample of warehouse managers most often said that they use EDI for exchanging warehousing information, i.e. concerning their operations. The processing of orders was ranked second; this high ranking is found across other industries. The fact that customer contact as rated third provided another strong indicator that the firms surveyed were likely to use EDI for customer communications.

Two suppliers of transport service were listed as potential information contacts. EDI is sometimes used between warehouses and motor carriers, ranked fourth, but seldom was EDI contact made with railroads, ranked eighth.

Rated fifth, the accounting activity of bill paying was sometimes handled by EDI. Supplier contact via EDI was rated sixth out of eight activities. As such, it was less likely than customer-oriented exchanges. EDI between the warehouse and the production department (which may be seen as an internal form of supplier) ranked seventh, between sometimes and never. The suggestion appears strong that the firms in the sample were using EDI to interchange information with their customers much more frequently than with their product suppliers.

Study results indicate no relationship between EDI use and size of firm. Two measures for size were obtained: number of employees and annual sales. The median number of employees in the firms was 125; the range was from three to 2,500 employees. Median sales were \$75 million, ranging up to \$2.5 billion. The null hypothesis that there is no relationship between EDI use and the size (employees or sales) of the firm was not rejected for either case based on a chi-square test. These results are supported by the availability of computer equipment for even very small organizations. The resources for adding EDI may be the cost of a modem, the software, and time spent to learn the commands. Likewise, the null hypothesis relating EDI use and type of product (consumer or industrial) was not rejected. Although the transaction channels for these product types may differ, there was no demonstrated difference in adoption of the EDI technology.

ADOPTION AND DEVELOPMENT

As shown in Figure 2, the idea to adopt an EDI system had originated most frequently from the firms' customers. (Figure 2 omitted) Top management, warehousing personnel and "other" internal personnel, in that order, also proposed EDI. This ranking underscores the importance for these managers of knowledge about changing technology. Others outside the warehousing area, including EDI systems vendors, were less likely to be the source of the idea to adopt EDI.

REASONS FOR NOT USING EDI

Those who were not EDI users ranked a multichotomous list of reasons: effectiveness of the current system, lack of familiarity with EDI, and cost and lack of benefits. Respondents did not indicate that a lack of staff was their reason for not using EDI. Other factors were also noted, such as lack of customer demand, lack of commitment from clients, and internal politics.

INFORMATION EXCHANGED

As shown in Figure 3, status reports on product availability and bills of lading information were exchanged by over 70 per cent of the respondents. (Figure 3 omitted) Billing and location information, also concerned with product flow, were exchanged by 60 per cent of the respondents. While these information exchanges were being used to communicate with customers, they also comprise potential EDI applications in handling inbound product movements and communications with suppliers.

Respondents also indicated that the frequency of these EDI exchanges was most often daily (63 per cent). Information exchanged continuously (24 per cent) and hourly (15 per cent) shows that a sizeable portion of these warehouses require more frequent updates.

BENEFITS AND DISADVANTAGES RANKED BY WAREHOUSE MANAGERS

Figure 4 displays the ranking of the logistics-related benefits of EDI for the responding s. (Figure 4 omitted) Four benefits of using EDI use were indicated on at least 80 per cent of the responses: time savings, customer relations,

reduced paperwork and accuracy of information. These benefits are consistent with those experienced by other users of EDI. Operating cost was considered a benefit by 70 per cent, a recognition of the advantage of time saved and reduced efforts of documentation. (This finding was balanced by the approximately 30 per cent who included several cost categories as disadvantages; see Figure 5.) (Figure 5 omitted) Other benefits noted by more than 40 per cent of the respondents followed the general pattern of timely information requirements: knowledge of product availability, bills of lading, knowledge of location and billing information. Supplier relations ranked 13th.

Figure 5 shows that, while the number one ranked disadvantage of EDI use (46 per cent) was customers' lack of EDI capabilities, the second ranked disadvantage (43 per cent) was their suppliers' lack of EDI capabilities. It appears that some customers had taken the lead and brought their warehouses into the EDI fold, but many remained who were still not using EDI to communicate with their suppliers.

The next three disadvantages of EDI were all cost based: software, outside support, and hardware. Since resource requirements are generally viewed as a drawback, the inclusion of costs in the ranked list is not unexpected. The lack of managerial commitment and trained personnel, two additional resource-dependent factors, followed in the rankings with 23 per cent of respondents selecting each. Communications and other costs, and the possibility of system malfunctions, trailed the list of disadvantages at 17 per cent each.

CONCLUSIONS AND IMPLICATIONS

The results indicate that warehouse managers were active users of electronic data interchange, with EDI reported in use at three out of four warehouse facilities represented. (The EDI portion of total transactions was not indicated.) However, in the primary area of concern, warehouse contact with suppliers, EDI was not used as extensively as it was for exchanging other warehousing information, for order processing, or contacting customers or motor carriers. Contact with the production department (a type of supplier) and with railroads was even less likely via EDI.

Most often, the idea of implementing EDI had come from the firms' customers, with top management, warehousing personnel and other internal personnel also being credited. Upper management's commitment has been noted as vital for EDI to achieve its potential 42!. Among non-users, satisfaction with their current systems plus lack of familiarity and cost were cited as the three main reasons for not adopting EDI.

Four out of five warehouse EDI users identified time savings, customer relations, reduced paperwork and accuracy of information as benefits. Supplier relations did not constitute a highly-ranked benefit, an expected result when viewed with the fact that suppliers' lack of EDI capabilities was the second ranked disadvantage of EDI use.

From the survey results it can be concluded that information is being exchanged by warehouses via EDI for the outbound flow of products. Specifically, the four principal information exchanges with customers-product availability, bills of lading, billing and location information--are also potential exchanges with warehouse suppliers. An extension of the existing EDI communications to this interface is thus expected.

This study provided evidence that EDI use between warehouses and their suppliers occurred less often compared with the warehouse-to-customer interface. A major reason for this is that it has been the customers who often have provided the idea to implement EDI in these warehouses. In other words, the information exchange is customer driven. This finding is consistent with Kimberley's statement that: "The receiver of a message benefits more than the sender" 5, p. 188!. In most exchanges, however, both sides do benefit, even if unequally, from a more complete, accurate and timely information exchange. Thus, while the impetus to use EDI may have come from warehouse customers, it is logical to expect other information linkages to benefit from EDI's potential.

When the situation is reversed in the warehouse-supplier interface, the warehouse has the role of customer and the warehouse's information needs and potential benefits mirror those of present customers on the outbound side. Warehouse managers will need to demonstrate to their suppliers the mutual benefits which both sides of this interface will receive through the more timely and accurate information exchanges provided by EDI. The strategy implication drawn from this study is that the idea to implement EDI in the warehouse-supplier interface will be more likely to come from the warehouse side than from their suppliers. This sequence of events would be to the advantage of the warehouses which have already implemented EDI systems (hardware, software and procedures) based on their customers' information requirements. They will be able to develop their existing systems further, instead of adapting to entirely new designs proposed by another outside party. This gradual adoption is similar to the three-level pattern described by Emmelhainz 12, p. 128!, beginning with one department and one transaction

set for a few trading partners and progressing to complete integration of EDI with all trading partners linked. As these linkages pervade the entire supply chain, including the warehouse-supplier interface, the use of EDI will move from providing a competitive advantage to being a necessary prerequisite for remaining competitive.

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Rowley, Jennifer. International Journal of Retail & Distribution Management. Bradford: 1996. Vol. 24, Iss. 3; pg. 26

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Subjects: [Retailing industry](#), [Electronic commerce](#)
Classification Codes: [8390 Retailing industry](#), [5250 Telecommunications systems & Internet communications](#)
Author(s): [Rowley, Jennifer](#)
Article types: [Feature](#)
Publication title: [International Journal of Retail & Distribution Management. Bradford: 1996. Vol. 24, Iss. 3; pg. 26](#)
Source Type: [Periodical](#)
ISSN/ISBN: [09590552](#)
ProQuest document ID: [116358204](#)
Text Word Count: [7182](#)
Article URL: http://gateway.proquest.com/openurl?url_ver=Z39.88-2004&res_dat=xri:pqd&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&genre=article&rft_dat=xri:pqd:did=000000116358204

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The challenges that shopping and other commercial transactions on the Internet pose for the retailing industry are examined. Challenges for the Internet retailer include comparison shopping, security and the marketplace controls (or lack of them).

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Introduction

There is much hype concerning the Internet and its potential to provide a virtual experience in a wide range of different areas of society. Increasingly, businesses are recognizing the potential of the Internet and it has been noted that, "the Internet is becoming a hotbed of advertising and commercial activity"[1]. There are fears that the Net's "free-spirited commune will be torn up and replaced by a giant on-line shopping mall". This may have further significant consequences for the very nature of retailing, quite apart from the fundamental effect that it might have on the structure of the industry. Open Market, a recently launched electronic commerce company, for instance, believes that "broadband communications, ubiquitous computing power and multimedia applications will again change how we shop and where we find our sense of community. The time honoured 4 P's of marketing - product, place, price and promotion - seem no longer to apply"[2]. Yet other commentators believe that the Internet shopping mall has a long way to go before it reaches its full potential. Resnick[3] claims that, "For all the hype about Internet commerce, the reality is that Internet shopping is not yet ready for prime time...Despite all the

cybermalls and storefronts popping up on the Web these days very few businesses are making big money selling goods and services on the Internet".

This article examines the challenges that shopping and other commercial transactions on the Internet pose for the retail industry. After a brief review of some earlier teleshopping ventures, it explores the nature of some of the Internet shopping malls, with particular reference to the types of products that are being retailed on the Internet. It then reviews some of the barriers to the further development of shopping on the Internet. Finally, taking both the possibilities and the constraints into account, it notes some projections concerning the potential rate of development of the Internet marketplace.

Earlier teleshopping

Teleshopping is not a new concept. The first information services that were target marketed to the end-user in the home were the viewdata systems, such as, in the UK, Prestel[4], for example, where some early experiments with teleshopping were carried out in Gateshead and Bradford. In the USA, cable television has supported the establishment of a significant teleshopping market. It is likely that some of the customers of these services will migrate to Internet retailing. Participating retailers have gained from these experiences, but these ventures were not supported by a technology that was as powerful as the Internet. As compared with these alternative technologies the Internet offers:

- international connectivity and access to international markets;
- a strong North American market, which in many senses could be viewed as the domestic market for most Internet retailers;
- full multimedia display facilities, which allow retailers to display and demonstrate their products, possibly with the use of audio and video (in some cases, as in the sale of music, for example, such facilities allow the customer to sample the product);
- more sophisticated electronic ordering and payment facilities;
- a much larger installed base of workstations, thus giving access to customers, in both the consumer and business sectors of the marketplace.

What is the Internet?

The Internet is a collection of interlinked computer networks, or a network of networks. Currently, it connects over one million different computers and the rate of increase in use and new subscribers is growing on a month-by-month basis. The Internet provides global connectivity via a mesh of networks.

'...the Internet offers a gateway to a myriad of online databases, library catalogues and collections and software and document archives, in addition to frequently used store-and-forward services, such as UserNet News and e-mail...'

Historically, the Internet was essentially an academic network, but business use is growing, so the Internet is no longer an elite network for communication between eminent research centres, but also is accessible to small colleges, small businesses and libraries throughout the world. The Internet offers a gateway to a myriad of online databases, library catalogues and collections and software and document archives, in addition to frequently used store-and-forward services, such as UserNet News and e-mail.

Resources available via the Internet

The resources available via the Internet are constantly changing, so any list is liable to date. Nevertheless, in order to indicate the scope of the information available on the Internet, a brief review of some of the types of database will be useful. First, however, it may be useful to summarize the categories of use of the Internet. These are:

- e-mail - allowing users to send messages or files to one another;

- news - to inform users of available information;
- remote log in - allows users to log in to remote sites;
- ftp - (file transfer protocol) allows users to access and retrieve files at remote sites.

More specifically, to investigate the type of information available at remote sites, or to consider the nature of information resources available on the Internet, it is useful to think in terms of the following six categories:

- (1) Listservs and discussion groups. There are listservs and discussion groups on a very wide variety of topics. Participants have the opportunity to exchange current information and conduct a dialogue.
- (2) Subject databases, particularly from academic institutions. Increasing numbers of institutions, particularly academic and research institutions, are making databases in their subject specialities available. [Indiana University](#) has, for example, mounted a number of files in the area of biology.
- (3) Community information. Often through their public libraries, communities are providing access, either dial-up or via Internet, to local data such as the catalogue of the public library, a tour of the art gallery, tourist information, weather reports and other demographic information.
- (4) Government resources. Both national and local governments are providing information. For example, the Indiana State Library has mounted a Gopher server which provides access to the Indiana Code (the state law), and the US Federal Government has opened a Web site.
- (5) Library catalogues. Increasing numbers of libraries are making their catalogues available over the Internet. Although the majority of library catalogues available are those of large university libraries, public libraries are also beginning to make their catalogues available.
- (6) Commercial and business resources. This category includes the services that are described later, in the context of shopping, and also includes commercial online databases Dialog, [Lexis/Nexis](#), Dow Jones News/Retrieval and many others.

Tools for searching the Internet

With such a vast array of databases and services available via the Internet it has been important to design interfaces that help users search the information sources and services available on the Internet. Retrieval is recognized to be a significant problem on the Internet, with databases in a wide variety of different formats and numerous different search retrieval software packages mounted on the different computers and providing access via different interfaces to subsets of the databases.

Various print-based similes have been used to describe the situation, one of which is that the current state of the Internet can be likened to a library in which everyone in the community has donated a book and tossed it into the middle of the library floor. Current tools which support searching include: Gopher, Archie, WAIS (Wide Area Information Server) and various Web clients such as Mosaic, Netscape and LYNX.

World Wide Web (WWW or W3) merges the techniques of information retrieval and hypertext to make a powerful global information system. The WWW world consists of documents and links to other documents, hence the term "Web". It is WWW's hypermedia capability that is rapidly establishing WWW as a tool. The Web uses the usual client/server model with the two systems (the client and the server) communicating using a simple protocol called HTTP (Hypertext Transmission Protocol), which allows for the data type to be transmitted. For instance, if a Postscript file is being viewed then the client system automatically runs a Postscript preview to view the data file. Similarly for video, graphical and digital sound information can be accessed.

Client programs are called browsers. Mosaic, Netscape and Lynx are World Wide Web clients or browsers; that is, they are software programs which allow users to view information supplied over the World Wide Web. Mosaic is an integrated tool and, like many other browsers, also provides access to Telnet, ftp, Archie, Gopher and other services. Mosaic and Netscape are graphical user interfaces, providing access to both text and graphics, while

Lynx provides access to text only. WebCrawler and WebWorm are recently developed search engines for locating resources on the World Wide Web.

Some examples of shopping malls

It is possible to venture into selling on the Internet using the relatively low-tech selling vehicle of e-mail, which facilitates communication between the retailer and the customer. Other, more established tools such as Telnet and Gopher have been used to support shopping activities, but by far the most interesting and fastest growing segment of the Internet is the World Wide Web. Here, cybermalls, virtual storefronts, interactive Web page and online data entry forms are being established. Web presences can take the form of small advertisements or large virtual stores. Cybermalls are usually large Web sites that seek to emulate traditional shopping malls, offering stores, services and guides to information. Merchants rent a storefront (actually a Web page) and advertise using text, images or video. The following is an example of some of these malls:

- (1) Apollo Advertising in England offers worldwide ads for services and goods. Pages are arranged by geographical categories, including Canada, Europe, the UK, the USA, and the rest of the world. Apollo offers online advertising services, from plain text to multimedia commercials.
- (2) Branch Information Services is one of the largest and oldest shopping malls. It uses e-mail, FTP and Gopher to deliver information. It provides electronic store fronts, information booths, automatic e-mail responders, FTP, Gopher and Web space; online forms support, and domain name registration service.
- (3) MarketPlace Com is operated by Cyberspace Development Inc., and primarily offers electronic information such as newsletters, electronic books and software journals, and reports through its Internet Information Mall.
- (4) MarketNet is a UK-based electronic mall, which offers a range of Net services, including: Lawnet, Flowernet, Chocnet, Artnet, Craftnet and Banknet.
- (5) The Interactive Super Mall offers a broad variety of merchandise, including books, newsletters, software, collectibles and employment services.

To achieve a Web presence, companies either build their own sites or lease space on a mall or Internet access provider's system. Some companies are putting up their own sites, but others prefer to contract for space, consulting, design and support services. There are numerous consultants or Web shops offering design services for WWW applications. Web shops handle everything from setting up pages on the WWW to promoting their clients' services online. Clients are typically charged a flat fee for these services. For example, the Internet Storefront offers a fixed price for a combined World Wide Web and Gopher set-up, including 25 documents of information and up to ten images. Retailers pay a fee to mall operators for such services. Maglitta[5] identifies the following initial development stages associated with opening for business on the Internet:

- set the information-sharing policy;
- restructure database;
- develop applications;
- integrate external and internal databases;
- test links with customers;
- negotiate the role of sales;
- develop a marketing strategy; and
- deploy client software.

Arguably, one of the most challenging aspects of preparing for doing business on the Internet is the need for systems professionals and marketing professionals to communicate effectively with one another. Maglitta's list of stages makes this plain.

Developments in electronic shopping software are under way. An early product is eShop. Electronic merchandisers use the software to design their electronic stores. Graphics design tools support the creation of a storefront. EShop also includes software for operating a server which stores the merchandiser's data. This records stock levels and re-stocking requirements, and keeps statistics on the purchasing and shopping habits of customers. So, for instance, if the customer often selects jazz CDs, the software can alert the customer to new jazz releases the next time he/she enters the store. EShop earns revenue from the service providers; retailers and customers pay nothing for the software.

ISN is one of the largest retailing operations, with nearly 20,000 products and 600 vendors. ISN offers customers a broad range of brand name products. ISN started with a product range that primarily included hardware and software, but is gradually diversifying. Everything ISN sells is on its server, and is housed in 14 warehouses across the country. Like a traditional retailer, it makes its money on the mark-up associated with the sale of goods. All the companies whose products ISN sells are listed free, but if the company wishes to undertake more extensive marketing it can pay for this additional promotion. These companies benefit from the retail traffic arising from being involved in ISN. Other additional facilities include electronic coupons for immediate discounts and hotlinks to other information on a topic elsewhere on the Internet.

'...First Virtual Holding has tailored its first electronic marketplace to merchants who want to sell information...'

Open Market Inc. has created a forum for electronic commerce together with a security system that challenges customers to identify themselves with personal information before they can complete transactions. First Virtual Holding has tailored its first electronic marketplace to merchants who want to sell information. It believes that freebies here and there are good advertising for information sellers. The company bars customers from shopping on the network if they abuse the privilege of obtaining merchandise before they pay[6].

Online catalogues are also becoming increasingly popular as a medium for browsing and distributing information. These can take the form of complex databases, such as those provided by Computer Literacy Book Shops or Macmillan Publishing, or more modest catalogues of consumer products such as those provided by the Faucet Outlet. DeLorme Mapping maintains a Web page where it provides mapping software and databases for business, education and government. Canadian Airlines International has set up a Web site to provide destination information, news updates, weather reports and flight arrival and departure information.

'...the challenge that faces the marketers in using these new multimedia tools is to create attractive and eye-catching presentations which encourage people to buy...'

What does an Internet store look like? This is difficult to encapsulate. Indeed, the challenge that faces the marketers in using these new multimedia tools is to create attractive and eye-catching presentations which encourage people to experience their shop and buy their merchandise. It is not surprising, then, that there is a great variability. For example, O'Keefe[7] examined the 300 and more booksellers on the Internet. On the surface many look similar, with their home page banner, hypertext link and database of book listings. However, a more analytical approach reveals that there are differences in:

- depth of inventory;
- amount of information provided for each title;
- search mechanisms;
- ease of ordering;
- customer service features, including the quality and quantity of entertainment at the site.

What can you buy over the Internet? The answer is almost anything, although there are some very evident foci. A number of the earlier entrants sold primarily computer hardware and software, and other information products,

including books and database access. Other significant product groups now include music and CDs. Gifts, toys and other commodities previously available via mail order are other major targets, but it is also possible to buy flowers, food and drink and a host of other products and services. The following list shows some of the products available from selected vendors:

- AP Professional - The Computer Book People;
- Professional Photographers' Shop;
- CD Shop;
- Comic Shop - Spite Books;
- Consumer Electronics and Security;
- Gift Shop - coming in time for Christmas;
- Music Shop
- Security and Safety;
- Video Extravaganza;
- Book Shops;
- Cassette Shop;
- CD-ROM Shop;
- Computer Books;
- Electronics;
- The Multimedia Emporium;
- PC Gameshop;
- Spite Books - Comics;
- Business Services.

Changing the marketplace and the product

Internet shopping has the potential to challenge the structure of the marketplace and the nature of the product. The Internet allows relatively easy and low-cost entry to new entrants to a marketplace. The following are some of the advantages of retailing on the Internet:

- Small businesses can extend their reach
- Eliminates prohibitive costs of entry to many industries
- Hardware and software advances permit improved interfaces and functionality
- Online information is current

- Interaction with customer representatives and immediate ordering are possible
- Eliminates costs associated with the store, salespeople and possibly some warehousing costs
- As compared with conventional catalogues there are no printing and mailing costs, and the information can be rapidly changed and updated
- Much more extensive advertising coverage can be achieved for a relatively small outlay

Internet retailing also has the potential to change the nature of some products. For example, Grimes[8] sees the Internet as providing new possibilities for the food service industry. He sees a future in which private television channels, and later the Internet, sponsored by multi-unit, multibrand concepts will provide customers with the opportunity to order through the television or the Internet. Customers will benefit from more information. Food production technologies and techniques will not only allow restaurants to provide a wider selection to customers, they will also allow the ability to ship long distances complete meals that can be finished and served at home.

Problems and challenges

Internet shopping presents challenges for both the retailer and the customer. There is widespread awareness of these issues and various developments that seek to eliminate the problems are under way. Although improvements in technology will minimize the effect of these issues, it will be a long time, if ever, before they are eliminated altogether. The stages in electronic shopping are:

- Search/Browse.
- View/Select.
- E-Order.
- E-Pay.
- E-Delivery.

The overall challenge is to ensure success at all stages in this process.

Locating the shops

It can be difficult to locate shops on the Internet. For example, to identify a flower shop you either have to know the location of an Internet flower shop, or perform a keyword search using a search engine such as Web Crawler. First, you need to know where to find the search tool. Because the Internet is a co-operative, there is no one to co-ordinate all of the shops so that they are grouped into a single online marketplace.

'...it is a lot easier to pick up the phone and order a pizza than it is to log on to the Internet and type <http://www.pizzahut.com>...'

On the other hand, one of the main attractions to individual retailers to participating in an Internet shopping mall is that this increases the likelihood of potential shoppers being able to locate them. Fundamentally, even if you are fairly experienced with the Internet, it is a lot easier to pick up the phone and order a pizza than it is to log on to the Internet and type <http://www.pizzahut.com>.

Identifying the products also requires sophisticated search software if users are to be supported both in their attempts to direct search and to browse. Operators, such as ISN, are working on improving these interfaces.

Comparison shopping

Most customers expect to be able to compare the available products and their prices from a variety of different

outlets. For example, if you were considering the purchase of a new computer or modem, you might scan the advertisements in a couple of paper-based computer magazines. Performing this type of comparison on the Internet is difficult. There are a number of computer stores on the Internet, but there is no way to browse them all at once, or even to find out where they all are, without spending a lot of time searching. Resnick[3] also reports some reluctance among Internet merchants to compete on price, or even publish prices at all. On the other hand, once the interface is available that does make this type of comparison possible, price comparison, in-depth information, comparative evaluation and analysis tools should make comparisons relatively easy, and may lead to fiercer competition in some marketplaces.

Security

The ability to keep monetary and proprietary information secure as it passes across the Internet and the need to authenticate the status and the identity of the sender are crucial for effective shopping transactions. Security has been a central concern both for customers and retailers. Businesses are experimenting with software solutions and various communications techniques for secure financial transactions.

On the Web the basic approaches to creating a secure environment are as follows:

Prior arrangements

The consumer orders by making offline arrangements by phone, post or fax for payments through a credit card or line of credit. Orders can then be made using Web input forms or through e-mail. This approach is used by GNN Direct and ISN. This tends to lock a customer into the use of specific stores or malls. Maintaining these arrangements with several malls can become very tedious.

Cybercash, a secure system for credit card purchases over the Internet, was introduced in early 1995[9].

Tokens

Consumers buy tokens, to be used with vendors who accept this type of payment. This method is more flexible than creating an account with each vendor, but there is still the matter of security in the codes being transmitted across the Internet. Also, only a limited number of vendors are using such systems.

Encryption

Sensitive data, such as credit card numbers, are encrypted on the fly using a variety of algorithms. Several companies are developing secure server systems. Secure HTTP systems have been developed by Terisa Systems, and Netscape Communications has developed its own secure server technology, called Secure Sockets Layer (SSL). These systems support the sending of credit card numbers or other data directly to each vendor. Other players in the secure transaction, Web-server business are ©IBM, NatWest's Modex subsidiary, Open Market Net Market Co.[10] and ©CommerceNet. It is also important to remember that, "it is by no means sure that general purpose credit cards will end up with as much of the market as some card executives hope"[11]. Consumers may prefer private label cards or another form of payment, such as e-cash.

Electronic cash

Secure credit card transactions are appropriate for transactions in excess of say \$200, but for vendors of low-cost items such as magazines e-cash is a more interesting option. DigiCash, for example, has a software product that can be downloaded onto a user's machine. The software is free to users; DigiCash hopes to make money by licensing its banking software to financial institutions that want to practise banking on the Internet. The GUI interface allows the dragging and dropping of icons representing stacks of coins, receipts, record books, etc.

To shop on the Net, with e-cash, you first draw digital coins from your Internet bank and store them on your hard disk. You use the coins when the vendor's software prompts you for payment. E-cash has the advantage of being anonymous. Transactions are final. Some believe that the arrival of e-cash will have a significant impact on market activity (e.g. [12]). However, for e-cash to be successful, there need to be some clear ground rules about the standards associated with the implementation of e-cash; a universal protocol for electronic money is necessary.

Earlier in 1995, MCI Communication's Corp. introduced its MarketplaceMCI program, the first brand name secure electronic shopping environment. The program is part of MCI's internetMCI program [13, 14].

'...some operators are still encouraging shoppers to place an order by electronic mail and then call a toll-free number to provide credit and shipping information to a personal shopper who creates the order...'

While security remains an issue, some operators are still encouraging shoppers to place an order by electronic mail and then call a toll-free number to provide credit and shipping information to a personal shopper who creates the order. At the end of the day, however, it is necessary to recognize that "secure" is a relative term. Cheques, cards and cash are regularly used in fraudulent ways in normal business transactions. Businesses recognize these problems and take steps to minimize losses, but accept that there is no perfect system. Accordingly, it is not realistic to seek 100 per cent security on the Internet.

Beyond security standards, there are also other problems associated with transactions on the Internet. Charge-back rules to cater for returned merchandise will need to be agreed. Also, pricing is currently at the 2 per cent bank card rate on mail order transactions; some believe that this should be reduced to the secure transactions rate of 1.35 per cent.

Customer base and profile

The 30 million and ever-increasing user base of the Internet looks like a large potential market. However, there are still few shoppers. For example, Resnick[3] cites performance for PC Gifts and Flowers. Although its Website gets 25,000 to 30,000 "hits" a day, only 200 orders a month are being placed. For some time, many Internet users have been college students; university professors and government officials, who have free Internet access. But a transformation is sweeping the marketplace as Prodigy, America On-line and CompuServe are making complete Internet access and custom-made Web browsers available. Sellers can now be accessible to the whole wired community through one presence. So, although at the end of 1994 fewer than 3 million Internet users had the ability to access the World Wide Web's multimedia cybermalls in multimedia format, and more than one-half of the Internet population had e-mail access only, this is rapidly changing[15].

Forester Research Inc., a Massachusetts-based market research firm, predicts there will be 5.4 million Web users in 1996, growing to more than 11 million in 1998 and 22 million by the year 2000. By that time, the Web-using world will be two-thirds consumers and one-third corporate and academic users. Forester predicts that this increase in the size of the market will be accompanied by an increase in gross revenues. In 1994, gross revenues from online services and the Internet totalled \$200 million. This is predicted to rise to \$4.8 billion by 1998. Other more optimistic projections believe that sales of goods and services on the Internet will reach \$600 billion by the turn of the century [11].

The shopping experience

Despite multimedia presentations, shopping on the Internet is no substitute for the leisure experience associated with conventional shopping. Resnick claims that "sellers of mainstream goods who think they will succeed on the Internet simply because they're making purchasing more convenient miss the point - shopping at their sites must be fun to attract customers"[3].

What attracts shoppers? Ellsworth says, "There are as many reasons as there are people, but most Net shoppers cite the speed of transaction, convenience, selection and price. Also attractive to on-line users is the immediate delivery of information and digital products that can be had from home, work, or on the road. Net shoppers also like the interactive nature of e-mail, FTP, Gopher and the World Wide Web"[16].

In some contexts, Internet shopping can be inherently attractive when compared with normal shopping. For example, in retailing CDs, where in a normal store the user may need to pour over large catalogues and browse through racks of discs, in the Internet CD store, good database management can provide easy access to this information. A further benefit to customers is 24-hours a day, seven days a week accessibility, although access may be slower when the traffic on the Internet is high.

This enhancement of the shopping experience may be achieved by adding value. For example, PC Gifts and Flowers plans to have 150 sites on the Web within the next six months. In addition, it has created a searchable

database on its server which tells people "everything they ever wanted to know about roses". Later, they plan to add "communities of interest" about gardening, cooking, sports and other topics, as well as a virtual guide who meets shoppers at the door and helps them to select products and services.

'...PC Gifts and Flowers plans to have 150 sites on the Web within the next six months. It has created a searchable database on its server which tells people "everything they ever wanted to know about roses"...'

In general, Internet shopping has a long way to go in developing the shopping experience. Shields[17], for example, explores a variety of cultural and social issues associated with shopping, and comments on the way in which the shopping environment can be managed to create an attractive consumer experience. Internet shopping is very crude in the accommodation of cultural and social norms, and yet the challenge is all the more significant because retailing on the Internet potentially must address an international marketplace. More pragmatically, there is much truth in the following statement:"

Many current malls lack basic merchandise and have little coherence. Most importantly there are no anchor stores, no compelling attraction to draw traffic. In the future malls will host virtual communities which constitute targeted market segments[18]."

Who controls the Internet?

The Internet is a loosely linked set of networks. Accordingly, the global answer to who controls the Internet is nobody. This poses a number of potential ethical and marketplace questions. The component networks within the Internet are controlled by the telecommunication companies or PTTs. The PTTs charge for use of the Internet. The levels of these charges to end-users influence the levels of access and use of services such as retailing. This has had a number of significant consequences.

First, the culture of the Internet has been coloured to a significant extent by the fact that users in universities in the USA and the UK have benefited from, at the point of use, free access to the Internet. Second, telecommunications tariffs are very different in the USA to those in the UK. In the USA, access to the Internet is charged at a local telephone call rate, and this led to much faster development of the marketplace for Internet retailing in the USA than in, for example, Europe. A future concern is that there are uncertainties about charging as traffic increases - the Internet is not a free-wheeling drainpipe and capacity is limited.

'...The increasing use of multimedia poses enormous potential for congestion. At the same time, there are increasing numbers of services becoming available on the Internet...'

Extensive transmission of multimedia data is likely to pose capacity problems. Brody[19] expresses reservations about the capacity of the Internet to cater for increased demand. The increasing use of multimedia poses enormous potential for congestion. At the same time, there are increasing numbers of services becoming available on the Internet where delay in response is less acceptable than it is, with more established services such as e-mail. Improvements in technology will eventually probably resolve some of these capacity problems, but increase in use may outstrip these adjustments to capacity. More discriminating use-based pricing strategies are one solution, but these run counter to the culture of the Internet.

A further aspect of control on the Internet is the access to the network via software interfaces. Basically, these interfaces control which services customers are most likely to locate and therefore most likely to use. Until recently, many of these products have been shareware and free and this did not lead to any particular dominance in the marketplace. The most widely used software changed as better products were developed. However, the launch of Windows 95 has presented specific challenges to this laissez faire situation. Windows 95 includes a feature which offers easy access to the Internet, not a surprising feature in a software product that ©Microsoft would like to see installed across a wide user base, in an environment where most PCs are networked. However, it is ©Microsoft's very dominance in the PC software market, which may allow it more significant commercial control over how people access the Internet and what people access on the Internet, that is of concern to other Internet operators.

A further aspect of control concerns the law. Which law pertains, if, for example, a product is offered for sale in Australia via a server in Japan and the purchaser lives in Hungary? There are a host of issues in these areas that remain to be explored.

To return briefly to ethical uses and control of business on the Internet. Since there is little control over the information that is transmitted over the Internet, there is a real concern about the information and range of products that might be purchased there. This comment is perhaps brought into sharper focus when one recognizes that the Internet is increasingly used by young people below the age of 18.

This section has briefly sought to outline a few of the issues associated with Internet usage and to signal that, for both retailers and customers, some elements of the telecommunications infrastructure on which the transactions depend are likely to be subject to change over the next few years.

Making money on the Internet without selling

It is important for retailers and other companies using the Internet to recognize that the commercial use of the Internet is not restricted to its merchandising opportunities[20]. It is possible to achieve a competitive advantage by using the Internet without ever making a sale. Opportunities for such use of the Internet can be grouped into the following categories:

- Improvements in business communication. Businesses can use the Internet to improve the way in which business processes are conducted. Communication over the Internet can replace the use of the fax machine or express postal delivery services. E-mail is invaluable for day-to-day communication and may reduce the use of the telephone and the regular postal service.
- Enhancing customer service. Some businesses, such as computer hardware and software vendors, have a considerable demand for high quality, easily accessible customer support services. Posting service and engineering information in FAQ (frequently asked questions) files can reduce the labour costs of customer service operations and eliminate the tedium of providing repetitive verbal answers. Troubleshooting problems and addressing questions can be handled effectively using e-mail and file transfers. Software updates and fixes can also be forwarded via the Net.
- Sales support. The Internet can provide a highly effective sales support mechanism not previously available to small and moderate-sized companies. Through e-mail, salespeople can obtain up-to-date information quickly by contacting the appropriate people in their organizations to answer customers' queries, or alternatively a technical person can use the Internet to contact the customer.

Other applications are reported by Baran[21] in a quote from the Wall Street Journal:"

...the survey reported that the most common uses small companies said they would find for the superhighway would be the ability to take or place orders, conduct video conferencing, check the market prices or availability of raw materials, and analyse cash flows. Other favoured potential uses included creating and sending manufacturing and design specifications to staff, vendors and customers, gaining access to immediate inventory management, making competitive bids, conducting banking and stock market transactions, paying taxes and gaining access to image technology."

Replacing the 4 Ps

Welz[15], in quoting Hyojong Kim, a director of I...Pro, a digital advertising company, stresses that online marketing must be seen in terms of five components: promotion, one-to-one contact, closing, transaction and fulfilment. These five components might be substituted for the 4 Ps.

- (1) Promotion - includes advertising and creating product awareness. The Internet allows a marketer to post information on a server where it can be seen by many users. Nevertheless, to succeed in promotion, a marketer must understand the demographics of the audience, which is not the same as the audience that would be reached in print or electronic media. Information must be presented in a way that will hold the users' interests.
- (2) One-to-one contact - unlike a real store, the Net does not offer marketers opportunities of synchronous one-to-one contact with customers. The Net does, however, allow for asynchronous contact via e-mail, and this can be used to develop a relationship with a customer. A salesperson to respond to e-mail enquiries as they arrive is valuable, and electronic mailing lists can be used to e-mail reminders to customers.

- (3) Closing - involves setting the price and closing the deal. While this can be achieved through a collection of e-mail messages, Net buying is more like ordering from a catalogue. On the other hand, there is an electronic record of the sale and the deal struck.

- (4) Transaction - payment for goods is typically made in cash, or by credit card. Until recently, such transactions were difficult over the Net. Increasing numbers of companies are introducing systems to enable secure credit card transactions on the Net. Digital forms of currency are also being developed by companies like DigiCash, CyberCash and NetCash.

- (5) Fulfilment - involves the delivery of goods. Delivery online is restricted to digital products such as electronic books and software. Fulfilment includes not only shipping, but also effective electronic order processing. This can be achieved much more efficiently than in systems where people are required to take and enter orders, because data entered by the customer go directly to all relevant parties. EDI is particularly useful for checking **inventory** in real time, to alleviate **back-order** problems and enhance **customer** service.

Conclusion

Resnick[3] says, "The Internet is great for marketing (depending upon the audience that you are trying to reach), but it is far less effective in generating direct sales. For now the Internet's real advantage isn't cost, it's presence. Combined with print, radio, television, direct mail, and telemarketing, the Internet can be a powerful tool, allowing businesses to get their messages to a world wide audience. By posting a brochure and other marketing information on the Web, they can show potential customers much more about their company and its products than they can in a newspaper advertisement or a television spot".

'...sales on the Internet have been insignificant but contacts made have been tremendous...'

Yamada[22] also emphasizes the marketing and promotion potential of the Internet: "Sales on the Internet have been insignificant but contacts made have been tremendous". Welz, quoting Eddie Warner of the Nolo Press suggests that, "People are still nervous about ordering on the Net, but Nolo's presence in GNN Direct also increases sales in the Berkeley bookstore. People walk into the store and say 'Wow, we saw you on the Net'"[15].

An interesting perspective is offered by Churbuck[23]: "the people making money off the Internet right now are not those selling products or re-engineering their businesses around the Internet. They are the people selling connections to it, software to navigate it, seminars, and books explaining it". This statement is borne out by a University of Michigan Business School online survey of 3,500 Internet users. About 79 per cent of respondents use the Web primarily for browsing; 66 per cent for entertainment; 59 per cent for education; 26 per cent for business research and only 8 per cent for shopping[24].

Hansen seeks to identify the determinants of the success of mass IS. He notes that, in general, there are a number of decisions that the operators of mass IS must make concerning:

- contents, such as products, processes, prices and conditions;

users, such as area and marketsegment;

- points of usage, such as carriers and terminals;

- time, such as starting time, offer time;

- methods of development and operations.

Success of mass IS depends on appropriate decisions being made in all of these areas, so that the goals of IS can be achieved. Success also depends on environmental factors such as market conditions, competitors and customers, and the telecommunications infrastructure by which services are mounted.

Despite the many unresolved problems, retailers are showing an increasing interest in the Internet as one of the world's fastest-growing markets. Some Internet merchants, particularly those selling books, newspapers and other

information-related products report encouraging results. Retailers need to continue to monitor the opportunities and challenges provided by the Internet and to make their own judgements concerning the most appropriate level of participation and investment for their product range and market segment.

An appropriate closing quote is offered by Schrage[25]:"

If the future of e-retailing will be about anything, it will be about rediscovering the fundamental principles of why people really buy. The real challenge for tomorrow's e-shopping malls will not be in substituting sophisticated software for human interaction, but in figuring out how to use software to create new kinds of interactions between people."

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Locations: [US](#)

Author(s): [Tom Andel](#)

Publication title: [Transportation & Distribution](#). Cleveland: Jan 1998. Vol. 39, Iss. 1; pg. 55, 5 pgs

Source Type: Periodical

ISSN/ISBN: 08958548

ProQuest document ID: 25791082

Text Word Count: 2540

Article URL: http://gateway.proquest.com/openurl?url_ver=Z39.88-2004&res_dat=xri:pqd&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&genre=article&rft_dat=xri:pqd:did=000000025791082&res_dat=xri:pqd&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&genre=article&rft_dat=xri:pqd:did=000000025791082

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The most flexible warehouse operations are built on basics. In most cases that means a warehouse management system, automatic data collection and well-maintained lift truck fleet. These technology basics have enabled many conventional warehouses to come to grips with customer's supply chain demand without having to make immediate heavy investments in more sophisticated automation. One of the biggest mistakes companies make is trying to bolt these technologies together. If these systems are not engineered to take advantage of each other's strengths, the benefits promised by vendors will never be achieved.

Full Text (2540 words)

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[Headnote]

WMS, AUTOMATIC DATA COLLECTION, MATERIAL HANDLING EQUIPMENT, AND WELL-TRAINED WORKERS ARE INTERDEPENDENT BUILDING BLOCKS FORMING A SOLID FOUNDATION FOR THE FUTURE OF YOUR BUSINESS.

The most flexible warehouse operations are built on basics. In most cases that means a warehouse management system (WMS), automatic data collection, and a well maintained lift truck fleet. These technology basics have enabled many conventional warehouses to come to grips with customers' supply chain demands without having to make immediate heavy investments in more sophisticated automation. But mastery of the basics isn't as easy as A-B-C. It requires discipline from everyone in your organization, from the people with purchasing authority for warehouse equipment and systems to the people with hands-on application responsibility.



[Photograph]

Crown's new Warehouse Management System will help their New Bremen, OH facility shift between large-order quantity picks for assembly lines to shipping small-order picks in support of their lift truck service aftermarket.

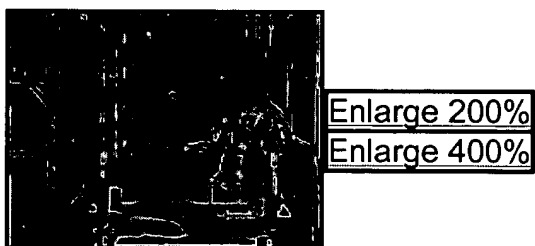
One of the biggest mistakes companies make is trying to bolt these technologies together. If these systems aren't engineered to take advantage of each other's strengths, you'll never get the benefits their vendors promise.

"With bolt-ons you end up getting data collection on the floor which can improve your reliability but you won't get the inventory precision and control you anticipated," says Greg Tabor, senior manager of Information Technology strategy for Caliber Logistics. "State-of-the-art warehousing systems today have automatic locator capabilities, so if you're not running in real time, an automatic locator isn't going to be very precise. At best it's a guess as to whether space will be available or not."

Getting the significant performance improvement these systems promise takes a lot of work. Before investing in technology, Tabor suggests you collect the needed metrics on your products-how do your products move? These figures will help you set up your WMS.

John Hill, partner with Cypress Associates, says there's a move afoot by various warehousing and distribution bodies to sharpen conventional performance metrics. (See the performance tables on page 61 for examples of various types of measures.) Hill says such metrics are useful when setting goals for technology application.

"Let's say on-time deliveries are at 87%," he suggests. "With a good WMS we might be able to get it up to 92%. What's that worth? You need to ask other people in the organization. Ask marketing what that could do for sales. By going through this kind of exercise with order fulfillment, inventory management, and warehouse productivity measures, you'll learn some things."



[Photograph]

Hill cites a study his company did for a Fortune 200 company looking at lines per person per hour in their distribution center (DC).

"Going in, they said they were getting about 75 lines per person per hour," Hill recounts. "Actual analysis showed they were doing about 30 lines per person per hour. Their approach had nothing to do with systems, but mostly with how they deployed their inventory in the warehouse. They put all their fast movers right next to each other and were picking with shopping carts, similar to the kind used in a grocery store. People were running into each other in the aisles because they were making more trips to the fast movers than to the medium movers.

Then they deployed their inventory throughout the warehouse. Magically the pick rate almost doubled, and they'll probably get up over a hundred by the end of the year."

If you apply these measures right after implementing new technologies, Greg Tabor warns you shouldn't expect impressive results right away.

"Many people underestimate what will happen when they turn these systems on," he continues. "They read all the literature on how these systems will improve productivity, and their assumption is that's what they'll get when they throw the switch. The reality is, just the opposite happens initially. You may have just introduced data entry to a lift truck operator who hasn't done data entry before. You get a natural productivity drop. It will take a while for them to get comfortable with the process, so you should expect to lose productivity out of the gate."

Maintain smarts

A couple of years ago a survey found that about \$2 billion was spent on warehouse automation in the US, and 60% of that went into WMS. The balance went into equipment and data collection. But these categories are co-dependent. The kind of equipment you use has a bearing on the WMS you require.

Some systems are better than others at dealing with different kinds of equipment and storage locations. For example, a lift truck operator can't go into a rack with a clamp any more than he can pick from the second tier of a racking system using a pallet jack. If you're in a warehouse with a wide variety of equipment types and capabilities, you need to look at a WMS that has the intelligence to discriminate.

Operators need to be intelligent too. Ruggedized RF terminals may be durable, but they'll eventually need repair. That's why there's a need for spares. There must also be a procedure in place for shipping broken units back to the vendor and to rotate equipment into usage so your lift truck fleet is fully equipped and usable. That also means battery rotation.

"If you don't drain them all the way down and then fully recharge them you'll eventually get shallow batteries that don't take a full charge any more," Tabor reminds. "By rotating your batteries and making sure they're properly conditioned, you get maximum life out of them."


Lift truck manufacturers are making maintenance easier and so are industrial battery manufacturers.

"Internal design changes, improved active materials, and stronger metallurgical construction of current-carrying grids provide improved power to the terminals," says Jeff Miller, executive director of the Lead Industries Assn. "This has resulted in batteries with reduced maintenance requirements, higher energy densities, and greatly increased ampere-hour capacities to meet the changing duty cycle needs of users. Sizing problems have also been resolved, and, properly sized, today's industrial battery works a full shift, and often half of a second shift, before needing a recharge."

"Smart" chargers, he adds, have also been developed to tailor each charge back to the preceding discharge. This improves battery life and reduces the charging period.

Employees also need maintenance, and only through a consistent training program can you get maximum performance from your workforce. If you don't have an integrated training process to bring new hires on in a way that makes them productive and following procedures in the system, you won't get a full payback from your systems.

Encourage ownership

L/M Animal Farms, Pleasant Plain, OH, hasn't had a chance to assess the percentage productivity improvement they've achieved by investing in a new narrow-aisle warehouse system featuring RF-equipped stand-up reach trucks from  Caterpillar and a new computer system. But with application assistance from their dealer, Portman Equipment, Cincinnati, OH, productivity has increased in the round-the-clock finished goods warehouse. On an average day, the company's four Cat NRP35Ps, along with two rented NRP35Ps, put away manufactured product, pull orders, and stage the products for shipping.

[Enlarge 200%](#)[Enlarge 400%](#)

[Photograph]

LIM manufactures food for small animals and birds, so their challenge is to pack it as fresh as possible and ship it to the customer before it has a chance to get infested while sitting in the warehouse too long

"We're definitely faster and more accurate," says Mike Sullivan, purchasing and warehouse manager. "We attribute that to a combination of the narrow-aisles, reach trucks, and the computer system we installed six months prior to opening the warehouse."

Sullivan's main goal for this system was to maintain an accurate, up-to-date inventory. LIM was always running a day behind on inventory. The previous night's production wasn't put into physical inventory until the next day-after it had been shipped. It wasn't taken out of inventory until the company did the billing. As customers called and asked if they could order a certain amount of product, L/M couldn't give a definitive answer without going out to the warehouse and physically counting the product.

The new system at L/M is based on their IBM AS/400. The reach trucks have onboard computers and RFlinked bar code scanners from Teklogix. For putaways, operators scan a bar code and the computer system gives them a location. While picking orders they also scan each skid. When finished, they print a list of what's been picked and compare it to the pick list to ensure accuracy.

L/M worked with this system for six months in their old warehouse to get the operators as comfortable as possible with it before moving to the new environment. RF was new to many of them and they were uneasy about how it would affect their performance. In fact, for the first two of those months L/M maintained their old paper-based strategy while the operators learned all about RF.

"After two months we got to the point where it became time consuming and we had too many errors," Sullivan explains. Then they made the switchover to RF for good. Or so they thought. "We actually had to go back to using paper about 45 days like paper because we had a computer lock-up," he adds. "By that time our people didn't like paper any more."

This technology may have been new to L/M's warehouse workers, but these people were still seen as valuable resources in configuring their homemade WMS to make it as efficient as possible. The new facility is taller than the old one, and L/M wanted to cut aisles space to the minimum. The employees helped determine those dimensions.

"The aisles are actually wider than the type of aisles these vehicles' tight turning radius allows for because a lot of our skids have some overhang," Sullivan says. "As we developed the rack system we told the programmer where we were going to put items and how we'd like them to flow in the system. The program is tailored to how we function here as an organization. Having our own programmer on staff really helped because we changed and added features as we went along."

L/M was purchased by another company last year and Sullivan expects to be more aggressive in adding capabilities to the warehouse system this year. But for now, he's happy they've met their main goal of inventory visibility.

"We can look at stock rotation and the customer service people can give an exact answer about inventory status," he concludes. "It's improved communications with our customers."

The L/M experience demonstrates that as well-trained employees mature in your environment, they become valuable resources when it's time to add or change technologies.

"Everyone on the warehouse floor must be involved in the process of adopting , introducing, implementing, and accepting new technology," says John Hill. "If ownership doesn't develop, the system will not work correctly."

Avoid computer clog

The key to a WMS success is the ability to manage task execution in real time. If it's dragged down with archiving and analytical requirements, response time begins to suffer, says Hill.

"This is what the purveyors of Enterprise Requirements Planning (ERP) systems are learning," he continues. "Running all your warehouses off the central server with an SAP system is fine as long as you're not running payroll or human resources management or some other higher level set of tasks at the host level. But load up a host level system with real time execution tasks and you'll drive it to its knees in terms of response time."

Timeliness was a key element in Crown's goals for a new warehousing system serving its manufacturing plants worldwide and aftermarket distributors. The New Bremen, OH-based lift truck manufacturer's new 55,000 sq ft warehouse is 50-ft high and incorporates high bay storage, ten receiving and shipping docks, small-parts storage, and a drive-in-dock area. With this wide variation in space configurations, an equally varied lift truck fleet was required, including three turret stockpickers, eight stockpickers, and five reach trucks. Inventory tracking had to be available to manage a variation of 52,000 different part numbers, while storing more than 22,000 of those parts in over 27,000 locations. The WMS had to be able to manage over 6,500 tasks per day, as well as the cycle count activity of over 400 tasks per day-all in a realtime environment.

Order Fulfillment	
MEASURE	CALCULATION
On-Time Delivery	Total Orders On Time Total Orders Shipped
Order Fill Rate	Orders Filled Completely Total Orders Shipped
Order Accuracy	Orders Shipped w/o Errors Total Orders Shipped
Line Accuracy	Lines Shipped w/o Errors Total Lines Shipped
Order Cycle Time	Actual Delivery Dates Customer Order Dates
Perfect Order Completion	Perfect Delivery Orders Total Orders

Enlarge 200%
Enlarge 400%

Order Fulfillment

Inventory Management	
MEASURE	CALCULATION
Inventory Accuracy	Actual Quantity/SKU Reported SKU Quantity
Damage	Total Damage \$\$\$ Total Inventory Value
Days On Hand	Average Monthly Inventory Value Average Daily Sales for Month
Storage Utilization	Average Occupied Storage Area Total Storage Capacity
Dock-to-Stock Time	Total Dock-to-Stock Hours Number of Receipts
Inventory Visibility	Time of Receipt Data Entry Time of Physical Receipt

Enlarge 200%
Enlarge 400%

Inventory Management

Warehouse Productivity		Enlarge 200%
MEASURE	CALCULATION	Enlarge 400%
Orders per Hour	Total Orders Picked (8-Packed) Total Warehouse Labor Hours	
Lines per Hour	Total Lines Picked (8-Packed) Total Warehouse Labor Hours	
Items per Hour	Total Items Picked (8-Packed) Total Warehouse Labor Hours	
Cost per order	Total Warehouse Costs Total Orders Shipped	
Cost as % of Sales	Total Warehouse Costs Total Revenue	

Warehouse Productivity

The project team, consisting of the warehouse manager, the manufacturing engineer, an inventory control representative, an MIS representative, and the material control manager, worked with Atlanta-based consultants, Richard Muther & Assoc. Together they came up with a base requirements document explaining what they'd need in a WMS package. After coming up with a short list from the hundreds of available packages, they chose the Robocom Inventory Management System (RIMS). According to Larry Kellermeyer, material control manager for Crown, off-the-shelf functionality was a key WMS issue.

"Many of the WMS vendors talked about rewrites and enhancements," he says. "They needed to research how we did business and then they'd tell us how to modify their system to Crown's needs. We weren't after that. Our install had to be four months."

On top of that, the system had to manage a wide spectrum of functionality. Being the DC for the entire company, it has to do everything from aftermarket parts shipments one piece of this, two of that to moving skids of material out to assembly lines or other manufacturing sites.

As the warehouse was being configured, another team was starting to build the bridge between the host and the WMS. The challenge was to keep the two systems communicating in sync. They determined that the host would manage all open purchase order data, **customer** order entry, **back-order** data, and an aggregate picture of total **inventory**. RIMS would manage the physical warehouse floor, maintain inventories at a location level, and provide resource planning.

"I want to emphasize the importance of keeping the host system and the WMS open order and inventory balances accurate," Kellermeyer advises. "I also suggest that the security to the aggregate inventory balances be extremely tight."

Once orders are sent down to the WMS from the host, the person performing route releasing coordinates the orders into routes for the warehouse floor. This sets in motion the most efficient picking sequences. Those tasks are then sent down to the operator via an Intermec RF handheld or truck-mounted device.

When the stock handler makes a pick, a tracking identification number (TIN) is assigned and the operator scans the check digit at that location to ensure inventory accuracy. The inventory balance is updated at this time on the WMS and the host.

"A paper back up plan is in place to operate the warehouse if the RF system ever fails," Kellermeyer concludes. "We also put in place a good training program for warehouse personnel and supporting staff. In a little over 12 months, Crown went from design to a fully functioning warehouse with an operating WMS."

The moral is, an investment in the basics of warehousing can only pay off when the staff is trained to make best use of automatic data collection tools...which direct them by means of the appropriate WMS...which is supported by the right material handling equipment...which is managed and maintained by a well trained staff...

In warehousing, this is what's called a winner's cycle.

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Author(s): [Anonymous](#)
Article types: [News](#)
Publication title: [Industrial Distribution. New York: Apr 2000. Vol. 89, Iss. 4; pg. 22, 1 pgs](#)
Source Type: [Periodical](#)
ISSN/ISBN: [00198153](#)
ProQuest document ID: [52259644](#)
Text Word Count: [406](#)
Article URL: http://gateway.proquest.com/openurl?url_ver=Z39.88-2004&res_dat=xri:pqd&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&genre=article&rft_dat=xri:pqd:did=000000052259644

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E-commerce will become a reality for abrasives manufacturer Norton Co. next month and distributors will be a key part of the program.

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WORCESTER, MASS.-E-commerce will become a reality for abrasives manufacturer Norton Co. next month and distributors will be a key part of the program.

The company's e-commerce model uses Norton as the "store-front" on the Internet, with its distributors filling the "back office" function.

Essentially, customers can log on to Norton's Web site at www.Nortonabrasives.com, create a shopping cart and begin shopping. Once the order is complete, customers will be prompted to select a participating distributor that carries the products ordered. Norton then processes the order with the customer's credit card and electronically notifies the chosen distributor.

Once the distributor confirms the order back to Norton, the manufacturer can notify the customer electronically

that the transaction was processed. The distributor then ships the order to the customer - all within 24 hours.

Following the order, Norton pays the distributor for the product and for its involvement in the order fulfillment process.

Bob Gardiner, director of marketing and distribution for Norton Co., said the model is the first of its kind in the industry. He also added that Norton is in the early stage of developing its e-commerce model.

"Our strategy is to respond to the emerging opportunities the Internet provides to improve the way we conduct business and share information with our distribution community and end user customers," Gardiner said. "We see the tremendous advantages that the Internet provides in terms of speed, efficiency, access to information, and depth of data to customers and distributors."

The e-commerce initiative complements Norton's Interactive catalog, which has been available on its Web site for three years. In mid-March Norton distributors began signing up to participate in the e-commerce program. Gardiner said he expects customers to begin ordering online in May.

This is the second major Internet initiative announced by Norton in the last few months. In January, the firm launched its distributor extranet - a secure site where Norton distributors can access the same real-time information available to Norton's customer service representatives. Dubbed the "Abrasives Connection," the extranet is designed to increase distributor efficiency and improve customer service.

Both initiatives speak to how the Internet is affecting the industrial channel.

"It's not clear as to the full extent to which the Internet will alter our relationship [with] distributors and customers," said Gardiner. "But we do see tremendous opportunity to alter the present traditional role of the manufacturer and the distributor, as well as the cost and profit model."

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Source Type: Periodical

ISSN/ISBN: 00093033

ProQuest document ID: 49349965

Text Word Count 274

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Viridal Duo helpline Schwarz Pharma has launched a new helpline to support Viridal Duo. The free helpline (0800 731 2698) provides callers with information and advice on the treatment and allows them to order replacement Duoject applicators and any of the free erectile dysfunction patient booklets and instruction videos. Schwarz Pharma. Tel: 01494 772071. Tracheo Dressings on FP10 Metalline Non-adherent Tracheo dressings are now available on the Drug Tariff. The dressings from come in different sizes and are designed to fit around tracheostomies and large calibre drains. Vernon-Carus. Tel: 01772 627855. Achromycin caps unavailable Achromycin (tetracycline) capsules 250mg are currently out of stock due to unprecedented demand. Supplies are unlikely to be resumed until early April. Wyeth is advising customers that they will not be keeping **back orders**, but will **contact customers** as soon as stocks are **available** again. Wyeth Laboratories. Tel: 01628 604377. CP Pharmaceuticals additions CP has introduced fluoxetine capsules 20mg (30, basic NHS price #19.75) and enalapril tablets 5mg (28, #7.45), 10mg (28, #10.45) and 20mg (28, #12.45). CP Pharmaceuticals. Tel: 01978 661261. Trileptal coming soon Trileptal (oxcarbazepine) is a new anti-epileptic treatment which has been approved the US for use as monotherapy in adults, or as adjunctive therapy in adults and children aged over 4 for the treatment of partial seizures. Novartis will market the drug in the US in February and in Europe soon after. Trileptal is the first anti-epileptic to be approved for first-line use in the past five years, say Novartis, and offers an alternative therapy for newly diagnosed patients and the 30-50 per cent of sufferers who are poorly controlled on current treatment. Novartis Pharmaceuticals. Tel: 01276 692255.

Credit: Viridal Duo; Tracheo dressing; Achromycin (tetracycline); fluoxetine; enalapril; Trileptal (oxcarbazepine)

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